Appl. No.	:	10/666,188
Applicant	:	Jeffrey Wayne Eberhard
Filed	:	September 10, 2003
Title	:	Radiation Imaging System and Method of Collimation
TC/A.U.	:	2882
Examiner	:	Allen C Ho
Docket No.	:	RD 28,444-2
Customer No.	:	6147

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RESPONSE UNDER 37 CFR 1.116

Administrative Note: Applicant faxed a response on 23 November 2004 and did not received a return confirmation. When calling the inquiry number, Applicant heard that: "The USPTO is in the process of moving on 11/22. The EBC Fax line will be down until further notice." For this reason, Applicant is additionally sending via mail.

In response to the Final Office Action of September 29, 2004, please consider the following remarks which begin on page 2 of this paper.

REMARKS/ARGUMENTS

Applicant has carefully considered the Final Office Action mailed on September 29 2004 wherein claims 36-44 were rejected under 35 USC 102 (e), and Claims 36-42 and 44 were rejected under 35 USC 102 (b).

Applicant respectfully traverses the rejection of Claims 36-44 under 35 USC 102(e) as being anticipated by Wofford et al. US6260999). Applicant also respectfully traverses the rejection of Claims 36-42 and 44 under 35 USC 102(b) as being anticipated by Brown et al. US5751781 and as being anticipated by Liebetruth 5,377,252.

For anticipation under 35 USC 102, the reference must teach every aspect of the claimed invention, either explicitly or impliedly.

Applicant submits that the cited references do not, either individually or in combination, teach, suggest, or disclose the independent claim 36 and claim 44 recitations of (with emphasis added):

> 36. ...a collimator comprising an **adjustable geometry aperture** assembly configured such that an adjustment of the aperture geometry is **synchronized with the movement of said radiation source and coordinated with the radiation source position so as to limit the incident radiation to a predetermined exposure area at said detector**.
>
> 44. ...adjusting an aperture by synchronizing **the aperture geometry adjustment with the movement of said radiation source... such that a radiation beam emanating from said radiation source is collimated to limit the incident radiation to a predetermined exposure area**....

The concept of synchronization as mentioned in the independent claims 36 and 44 and has been adequately described in the "Detail Description of the Invention" section of the Applicant's application. For example, Paragraphs [0030], [0033], and [0036] of the Applicant's specification state:

> [0030] When the radiation source moves from one position to the next, the aperture is adjusted accordingly. The movement of radiation source and adjustment of aperture are synchronized, that is, their timing is coordinated. Furthermore, at least one of the position and the shape of the aperture during exposure (i.e., at the instant an image is acquired) is coordinated relative to the position of the radiation source ....
>
> [0033] In one embodiment of the invention, at least one of the shape of the collimator aperture and the movement of the collimator is controlled such that the relative position of the radiation source with respect to the collimator aperture is the same (meaning identical up to a magnification or scaling factor) as the relative position of the radiation source with respect to the detector. The advantages are that there is no spill of X rays beyond the edge of the active area of the detector and there is no shadow of the collimator falling on the active area of the detector, which results in an optimal field of view. ... .
>
> [0036] As described above, adjustment of the aperture geometry is synchronized with the movement of said radiation source by coordinating their timing, and the aperture geometry adjustment is further coordinated (i.e., at the instant an image is acquired) relative to the position of the radiation source, and relative to the position of the detector. The fact that the position of

> the aperture is appropriately coordinated with the position of source and detector ensures that no radiation spills beyond the edge of the detector (or active area / predetermined exposure area). .... .

With respect to Wofford, Applicant respectfully submits that Wofford appears to be devoid of any disclosure, teaching, or suggestion of synchronization of the aperture with respect to the radiation source. Wofford is not directed to source or source-detector movement - instead the emphasis in Wofford is to locate an iso-centre of an image using a multi-leaf collimator (column 2, lines 39-42 and 50-51) and position the collimator with respect to the iso-center (Fig. 3, column 5, lines 7-27). Nowhere does Wofford disclose, teach or suggest synchronization (either temporal no spatial) of the aperture geometry with respect to the radiation source.

With respect to Brown, Brown similarly does not disclose, teach or suggest, either explicitly or impliedly at least the above recited portions of claim 36 and 44 dealing with synchronization of the aperture geometry adjustment with the movement of the radiation source. Brown is devoid of any disclosure, teaching or suggestion about synchronizing, i.e. temporally and/or spatially adjusting the aperture shape with respect to at least movement of the radiation source. In fact, in direct contrast, Brown appears to teach away from the claim recitations. For example, Brown describes disadvantages of using the multi-leaf collimator (column 13, lines 48-65).

Applicant notes the Office Action statements with respect to Wofford and Brown on Page 7, first paragraph. However, those general statements, even if accurate, do not teach or suggest the precise type of synchronization recited in Applicant's claims: "so as to limit the incident radiation to a predetermined exposure area at said detector."

With respect to Liebetruth, this reference does appear to describe a form of aperture adjustment for a different purpose:

> During such a can, the thickness of the x-ray beam 7 is varied in accordance with the principles of the present invention. This is accomplished in the embodiment shown in the drawing by a **motor 14 which operates the diaphragm plates 8 so as to adjust the aperture formed by the plates 8, which in turn determines the thickness of the x-ray beam** 7. The motor is operated by a control unit 15 which receives a signal "a" from an angle sensor 16. The angle sensor 16 is positioned to generate a signal corresponding to the current angular position of the rotating frame 1, the signal "a" thus also identifying the current angular position of the x-ray beam 7. **If a slice of the examination subject 10 is to be examined which has a highly elliptical cross section, for example, the x-ray beam 7 will have to propagate through the larger distance within the subject when the central ray of the fan-shaped beam 7 is within a range in either side of the major axis of the ellipse of the elliptical cross section than will be case when the central ray of the x-ray beam 7 is within a range on either side of the minor axis** of the ellipse. As a consequence, the radiation of the x-ray beam 7 will be more attenuated when the central ray is within a first angular range than will be the case when the central ray is in a different angular range. **By monitoring the angular position of the rotating frame 1, and thus the angular position of the x-ray beam 7, using the angle sensor 16, the**

> **control unit 15, dependent on the signal "a" operates the motor 14 to adjust the aperture of the diaphragm plates 8 accordingly, so that the x-ray beam 7 can be made thicker as needed during the course of a complete rotation**. The radiation detector 5 thereby receives more quanta in those angular ranges wherein the beam is made thicker, thereby reducing the noise in the resulting signal. Reduction of the noise substantially reduces, or completely eliminates, the aforementioned image artifacts caused by signal noise.

Although Liebetruth appears to be addressing depth, Liebetruth appears to be completely devoid of any disclosure, teaching or suggestion regarding the recitation of claims 36 and 44 showing aperture geometry adjustment synchronized with radiation source movement to cause **predetermined exposure area at said detector**.

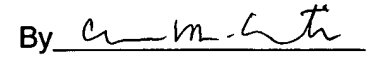
Accordingly, Applicant respectfully submits that independent Claims 36 and 44 define allowable subject matter over the applied art. Claims 37-43 depend directly or indirectly from claim 36 and hence are similarly allowable. Withdrawal of the rejections is respectfully requested, and allowance of the Claims 36-44 is respectfully solicited.

Summary

In view of the foregoing, Applicant respectfully submits that the application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are respectfully requested.

Should the Examiner believe that anything further is needed to place the application in even better condition for allowance, the Examiner is requested to contact applicant's undersigned representative at the telephone number below.

Respectfully submitted,

By 

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